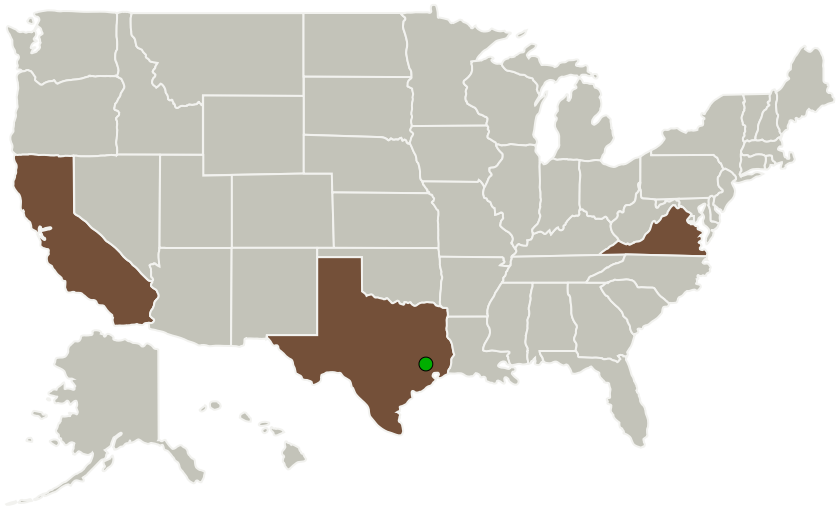
Self-Healing Inflatable Extraterrestrial Shield (SHIELD), Phase I

Completed Technology Project (2011 - 2012)

Project Introduction

The team of Astro Terra Corp, Virginia Commonwealth University (VCU), and Virginia Tech (VT) propose the development of a composite polymer over Phase-I and Phase-II into a "Self-Healing Inflatable Extraterrestrial ShieLD (SHIELD) membrane with autonomic self-healing properties and active radiation protection. The multi-layer composite architecture of SHIELD membrane is envisioned to have three layers. The outer layer is fabricated from polyimide and the innermost layer made from a viscoelastic polymer. The middle layer will be a self-healing layer fabricated from ionomeric polymers or PDMS-based ionenes and will be the focus of research activities in this program..The team proposes to fabricate the self-healing layer from two polymers (i) an ionomer (Surlyn) and (ii) a novel PDMS-based polyionene and demonstrate autonomic self-sealing in Phase-I. In addition, this polymer layer will be embedded with magnetoelectric nanoparticles and carbon fibers bundles that are in electrical contact and connected to an external circuit. The combination of magnetoelectric nanoparticles and carbon fibers will provide damage detection, resistive and/or inductive heating based self-healing and electromagnetic radiation protection. The polymer candidate that offers the most advantage in autonomic healing and radiation protection will be pursued for further development into a lightweight inflatable membrane in Phase-II.

Primary U.S. Work Locations and Key Partners



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Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
Astro Terra Corp	Lead Organization	Industry	Orange, California
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
Virginia Commonwealth University	Supporting Organization	Academia	Richmond, Virginia

Primary U.S. Work Locations	
California	Texas
Virginia	

Project Transitions

February 2011: Project Start

February 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138491)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Astro Terra Corp

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

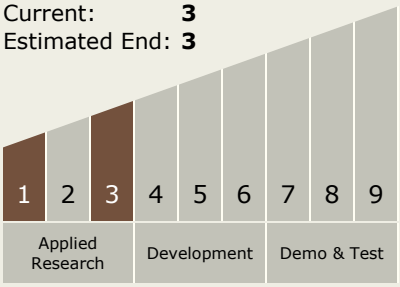
Carlos Torrez

Principal Investigator:

Vishnu Baba Sundaresan

Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.5 Radiation
    - TX06.5.3 Protection Systems

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System